

REMARKS

In response to the Office Action mailed May 21, 2003, Applicants respectfully request reconsideration of all rejections in light of the foregoing amendments to the claims and the following remarks.

Claims 1-8, 11, 16-25, 28, 33-46, 49, and 54-64 are currently pending in the application.

Claims 1, 11, 21, 28, 39 and 49 have been amended. No new matter has been submitted by way of these amendments to the claims.

Claims 1-7, 21-24, 39-45, and 62 stand rejected under 35 USC §102(b) as being anticipated by Yates et al. (US Patent No. 5,863,410).

Applicants contend that their invention as now claimed is not anticipated by the disclosure of Yates et al. Applicants have deleted reference to claiming polyethylenimine, 80% ethoxylated. As such, the teaching of Yates et al. of a polyethylenimine polymer does not identically disclose Applicants' claimed invention. Since Yates et al. does not teach other leveler compounds as being organic compounds containing single or multiply positively charged centers, it cannot be used to anticipate the invention as now claimed. Reconsideration and reversal of this rejection are respectfully requested.

Claims 20, 38, 58-61 and 63-64 stand rejected under 35 USC §103(a) as being unpatentable over Yates et al. as applied to claim 39 above. The Examiner contends that it is well within the skill and the art that specific ratios are relative dimensions that would have been adjusted through routine optimization depending upon operating conditions and users' preferences and intended use and therefore have little patentable weight.

Applicants contend that the particular weight ratios of carrier to leveler to brightener and any currents applied to the copper plating solution are not mere optimization of the compounds

and solutions taught in Yates et al. but represent novel and unobvious choices in arriving at Applicants' claimed invention. The weight ratios and current densities in these compositional claims are important elements in a proper copper plating solution for use in the fabrication of semiconductor devices, particularly those less than .18 microns and with aspect ratios greater than 5. Yates et al. fails to teach or suggest that each and every compound be present in a particular percentage to achieve the results that Applicants achieve. Applicants submit that this reference neither teaches nor suggests the compositional ranges, weight ratios nor current densities employed in the compositions and methods of the present invention. Reconsideration and reversal of this rejection are respectfully requested.

Claims 8, 11, 25, 28, 46 and 49 stand rejected under 35 USC § 103(a) as being unpatentable over Yates et al. as applied to claims 1-21 and 39 above, and further in view of Luxon (US Patent No. 4,808,481). The Examiner submits that Luxon teaches the addition of diethyldithiocarbamate and dimethylammonium chloride in the electrolyte composition. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have added the leveler or the brightener molecules as taught by Luxon into the electrolyte composition of Yates because Luxon teaches that diethyldithiocarbamate would enhance chelating while dimethylammonium chloride would enhance adsorption.

Applicants contend that their inventions as claimed in claims 8, 11, 25, 28, 46 and 49 are not obvious over the combination of Yates et al. in view of Luxon. Luxon is directed to injection molding granules comprising copper coated fibers. The use of several copper plating baths with various additives such as a stabilizer, brightener, wetting agent, and surfactant are taught in Luxon. However, Luxon does not teach or disclose the need nor the desirability of leveler compounds as those recited in Applicants' amended independent claims 1, 21 and 39 for the purpose of producing copper coated fibers. This is not unexpected when reading Luxon because a leveler is typically used to ensure copper deposition with void free and seam free trench filling as in that employed by Applicants' invention and not a problem or relevant to the copper coating of fibers. Accordingly, since Luxon does not recognize the problem associated with levelers nor teaches that it would be desirable to have particular levelers in a copper plating solution, there

would be no reason to combine this reference with the compositions taught in Yates et al. to arrive at Applicants' claimed invention. Reconsideration and reversal of this rejection are respectfully requested.

Claims 16-17, 33, 34, 37 and 54-55 stand rejected under 35 USC § 103(a) as being unpatentable over Yates et al. as applied to claims 1, 21 and 39 as above and further in view of DiFranco et al. (US Patent No. 5,215, 645). The Examiner contends that DiFranco teaches that gelatine components that are primarily animal glue in a copper electrolyte bath are used to increase brightness of the copper deposit. As such, the gelatine components of DiFranco are inherently brightener/carriers since they are also polymeric proteins that increase brightness of the copper deposit as claimed in the present invention. Further, the use of chloride as well as the animal glue would also have been obvious in light of Yates et al. for the purpose of decreasing roughness or dendrite formation of the copper deposit and hence increasing brightness.

Applicants contend that that their invention as claimed in claims 16-17, 33-34, 37 and 54-55 are not obvious over the combination of Yates et al. in view of DiFranco. Although DiFranco utilizes a different organic additive during the plating process to modify the ductility characteristics of the foil, these considerations are vastly different from those employed in fabricating semiconductor devices with feature sizes of 180 microns or below and an aspect ratio of 5 or greater. The electroplating processes are quite different. For example, Applicants have to choose the particular organic additives used in a plating bath such that copper is filled into a trench or feature size in a bottom up mode such that the bottom of the trench begins to fill up in a manner whereby there is even distribution and plating of copper throughout the trench. Indeed, as noted in DiFranco, a certain amount of roughness is desirable in the copper foil film and that the gelatine component is included in a matter to control this roughness. Further, there is no teaching or suggestion in DiFranco et al. that gelatine is an actual brightening compound. As noted in column 7, lines 1-14, the paper by Afifi et al. states that thiourea increases surface brightness of the deposit and not gelatine which is not discussed in this section.

As such, given that they are different electroplating processes involved here and that different end results between that taught in DiFranco and that claimed here by Applicants, there is no reason for one of ordinary skill in the art to look to the teaching of DiFranco et al. to utilize a gelatine or animal glue in the compositions and method of the present invention. Reconsideration and reversal of this rejection are respectfully requested.

Claims 18-19, 35-36 and 56-57 stand rejected under 35 USC §103(a) as being unpatentable over Yates et al. as applied to claims 1-21 and 39 above and further in view of Dubois et al. (US Patent No. 5,147,905). The Examiner contends that Yates does not teach the use of a specific carrier/leveler. Dubois et al. teaches the use of a carrier/leveler molecule such as melamine-formaldehyde and that although Dubois does not specifically teach the use of poly(melamine-co-formaldehyde), the use of melamine-formaldehyde would be equivalent thereto. As such, it would have been obvious to have added melamine-formaldehyde as taught by Dubois et al. into the electrolyte composition of Yates because Dubois teaches that melamine-formaldehyde would enhance cross linking and improved film properties absence of evidence to the contrary.

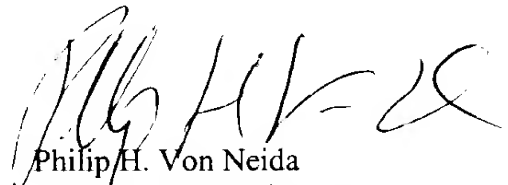
Applicants contend that there is no teaching nor suggestion to combine Dubois et al. in the electroplating bath taught by Yates et al. Dubois et al. teaches advanced and unadvanced epoxy resin compositions or nucleophilic derivatives thereof as well as curable compositions and coating compositions containing the same. However, Dubois et al. does not teach nor suggest an acid copper electroplating composition and method of use thereof containing a carrier compound, a water soluble, mercapto-containing organic brightener and a leveler compound as recited in Applicants' claims 1, 21 and 39. Furthermore, there is no suggestion or motivation in Yates to combine the electrolytic process of producing copper foil with the resin compositions in Dubois et al. And even if there was a combination of these teachings, one would still not arrive at Applicants' amended claims 1, 21 and 39. Accordingly, there is no teaching nor is there a suggestion to utilize a poly(melamine-co-formaldehyde) compound in the composition as taught in Yates et al. Reconsideration and reversal of this rejection are respectfully requested.

For these reasons, Applicants contend that their claims define patentable subject matter and are in condition for allowance. Prompt favorable action to that end is accordingly solicited.

The Examiner is invited to call the undersigned should any issue arise during the reconsideration of this application.

Respectfully submitted,

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